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Abstract

TRENDS IN WATER-MODERATED WATER-COOLED POWER REACTOR DESIGN

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A designer of water-moderated water-cooled power reactors should be guided by the considerations of maximum economic efficiency of a reactor. The efficiency of a reactor largely depends on reactor power per unit of reactor volume, simplicity and reliability of reactor unit design and the degree of optimalization of the operating parameters.

The paper discusses some considerations for selecting ratings and design parameters for water-moderated water-cooled reactors of progressive design and presents certain analytical techniques for parameter optimalization.

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Among other aspects the authors discuss problems involved in design of the steam generation system and selection of steam parameters in the power-generating cycle, types of steam generators and reactor body and present their views on the structure of the reactor core in connection with the necessity of frequent refueling of the reactor and the location of the reactor channels of the protection control system.

Particular attention is paid to simple approximate analytical procedures for the optimalization of the basic parameters of large water-moderated water-cooled reactors, viz. selection of a housing diameter, the geometry of the core cell, heat fluxes and specific heat transfer, dimensions and power rating of the reactor core, parameters and flow rate of a heat-transfer agent, thermal stress, steam pressure in the steam generator, etc.

As a promising system for reactor design the paper describes a water-moderated water-cooled reactor with individual temperature controllers at fuel units, deep burnup and refueling under pressure.